Title: Mechanism for Obtaining and Applying Constraints to Constructs
within an Interative Environment
Inventor:s: Snover et al.
Docket No: MS1-1740US
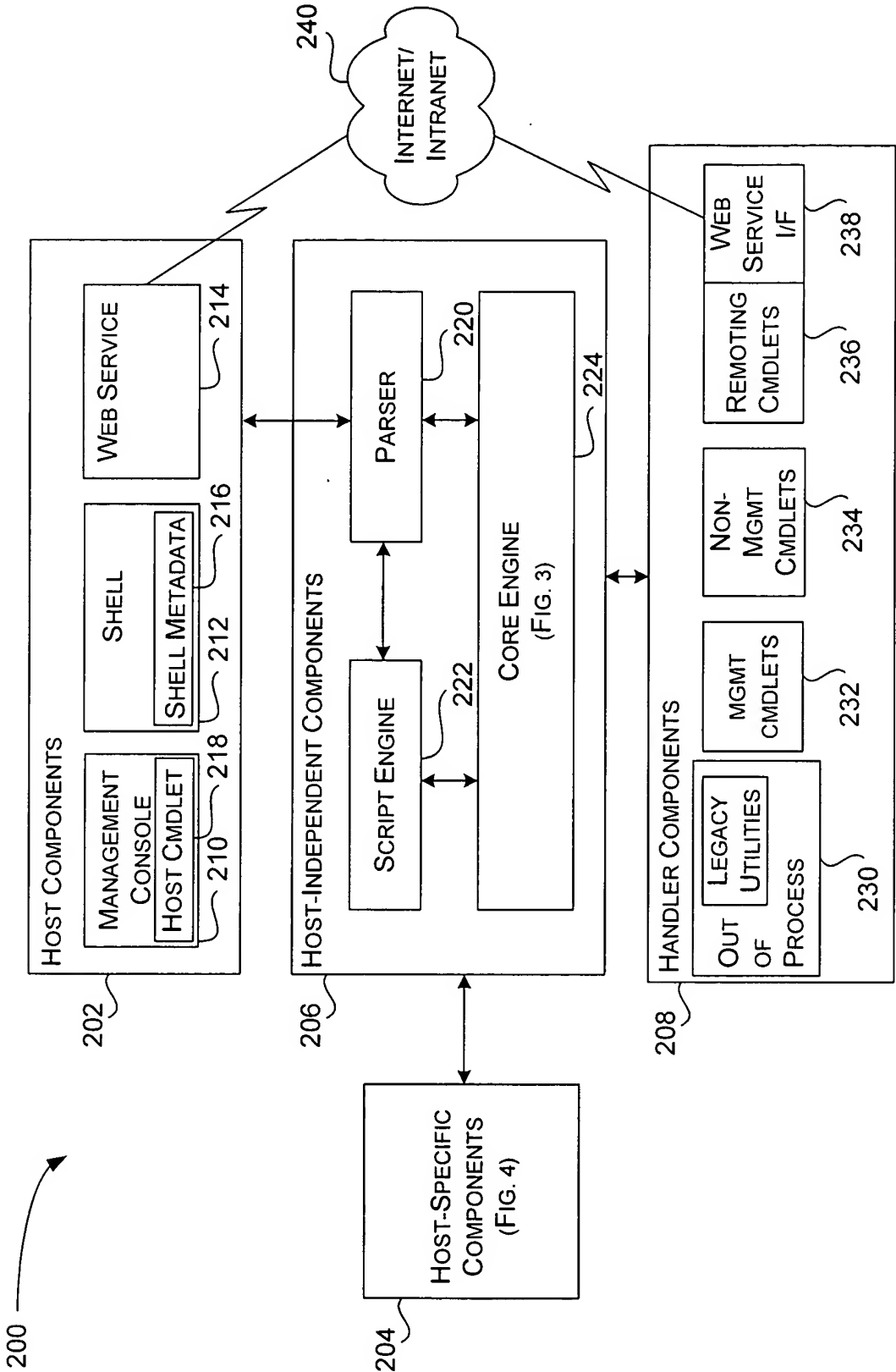
Fig. 1

Title: Mechanism for Obtaining and Applying Constraints to Constructs
within an Interative Environment
Inventor:s: Snover et al.
Docket No: MS1-1740US

200

240

INTERNET/
INTRANET

HOST COMPONENTS

202

MANAGEMENT
CONSOLE

210

HOST CMDLET

218

SHELL

212

SHELL METADATA

216

WEB SERVICE

214

HOST-INDEPENDENT COMPONENTS

206

SCRIPT ENGINE

222

PARSER

220

CORE ENGINE
(FIG. 3)

224

HANDLER COMPONENTS

208

OUT
OF
PROCESS

LEGACY
UTILITIES

230

MGMT
CMDLETS

232

NON-
MGMT
CMDLETS

234

REMOTING
CMDLETS

236

WEB
SERVICE
I/F

238

HOST-SPECIFIC
COMPONENTS
(FIG. 4)

204

Fig. 2

Title: Mechanism for Obtaining and Applying Constraints to Constructs
within an Interative Environment
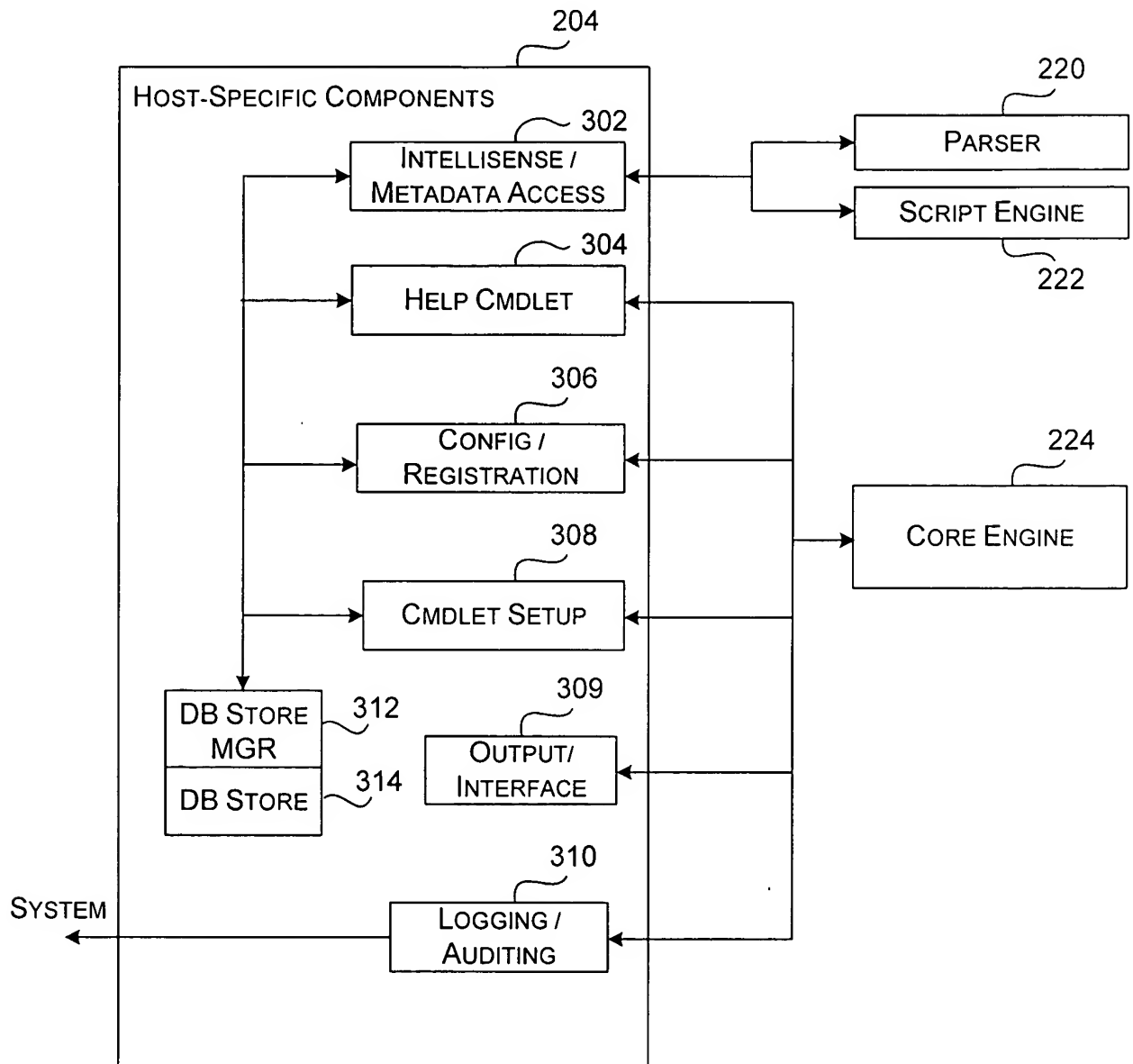Inventor:s: Snover et al.
Docket No: MS1-1740US

Fig. 3

Title: Mechanism for Obtaining and Applying Constraints to Constructs
within an Interative Environment
Inventor:s: Snover et al.
Docket No: MS1-1740US

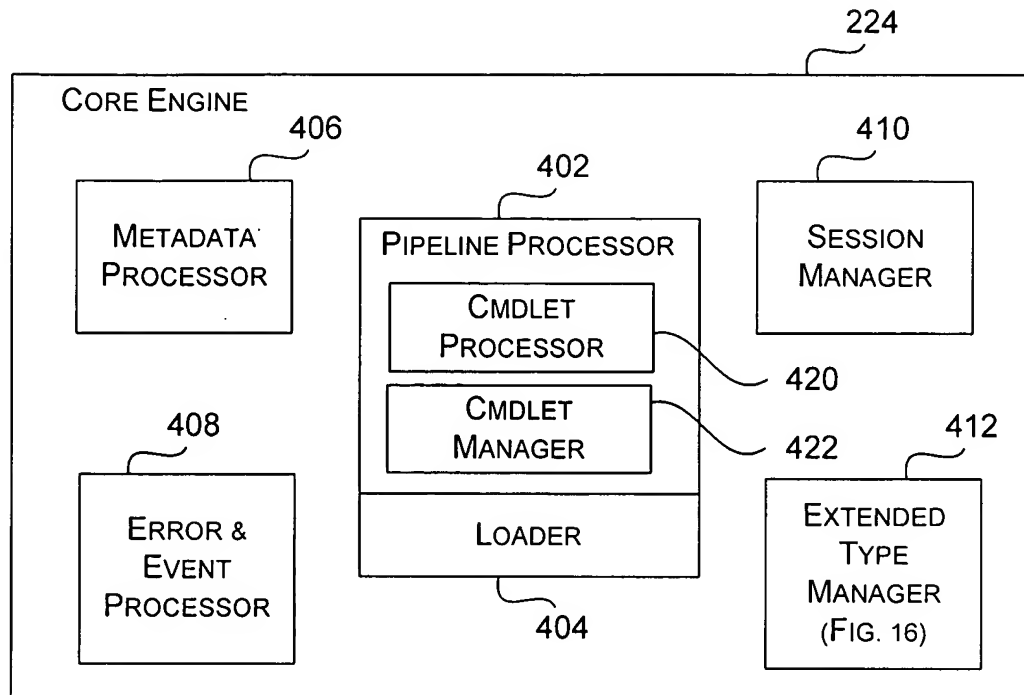224

CORE ENGINE

406

METADATA
PROCESSOR

402

PIPELINE PROCESSOR

CMDLET
PROCESSOR

CMDLET
MANAGER

LOADER

404

410

SESSION
MANAGER

420

422

412

EXTENDED
TYPE
MANAGER
(FIG. 16)

408

ERROR &
EVENT
PROCESSOR

Fig. 4

Title: Mechanism for Obtaining and Applying Constraints to Constructs
within an Interative Environment
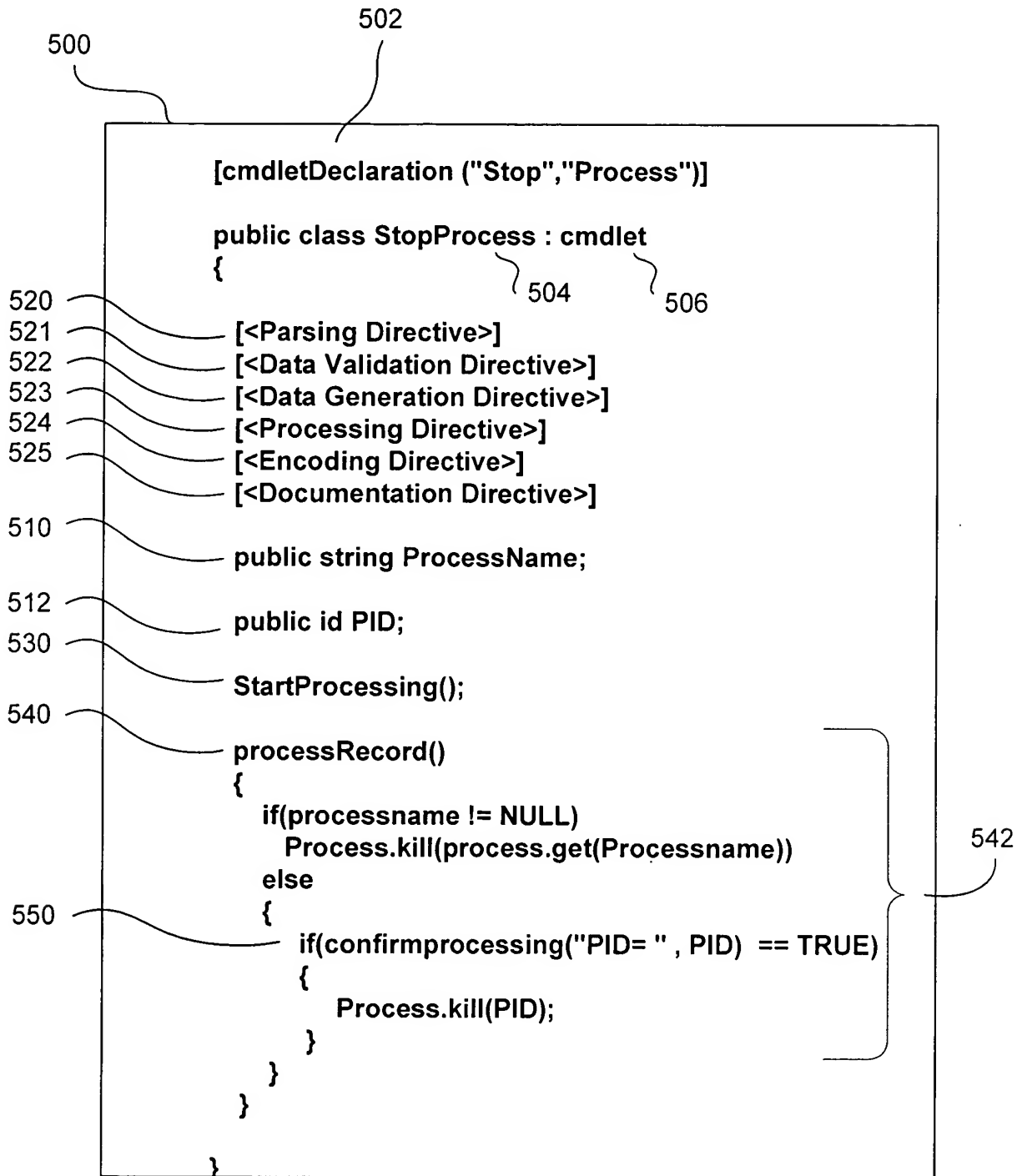Inventor:s: Snover et al.
Docket No: MS1-1740US

500

502

```
[cmdletDeclaration ("Stop","Process")]

public class StopProcess : cmdlet
{                                504        506

520     [<Parsing Directive>]
521     [<Data Validation Directive>]
522     [<Data Generation Directive>]
523     [<Processing Directive>]
524     [<Encoding Directive>]
525     [<Documentation Directive>]

510     public string ProcessName;

512     public id PID;

530     StartProcessing();

540     processRecord()
        {
            if(processname != NULL)
                Process.kill(process.get(Processname))
            else
550         {
                if(confirmprocessing("PID= " , PID)  == TRUE)    542
                {
                    Process.kill(PID);
                }
            }
        }

    }
```

Fig. 5

Title: Mechanism for Obtaining and Applying Constraints to Constructs
within an Interative Environment
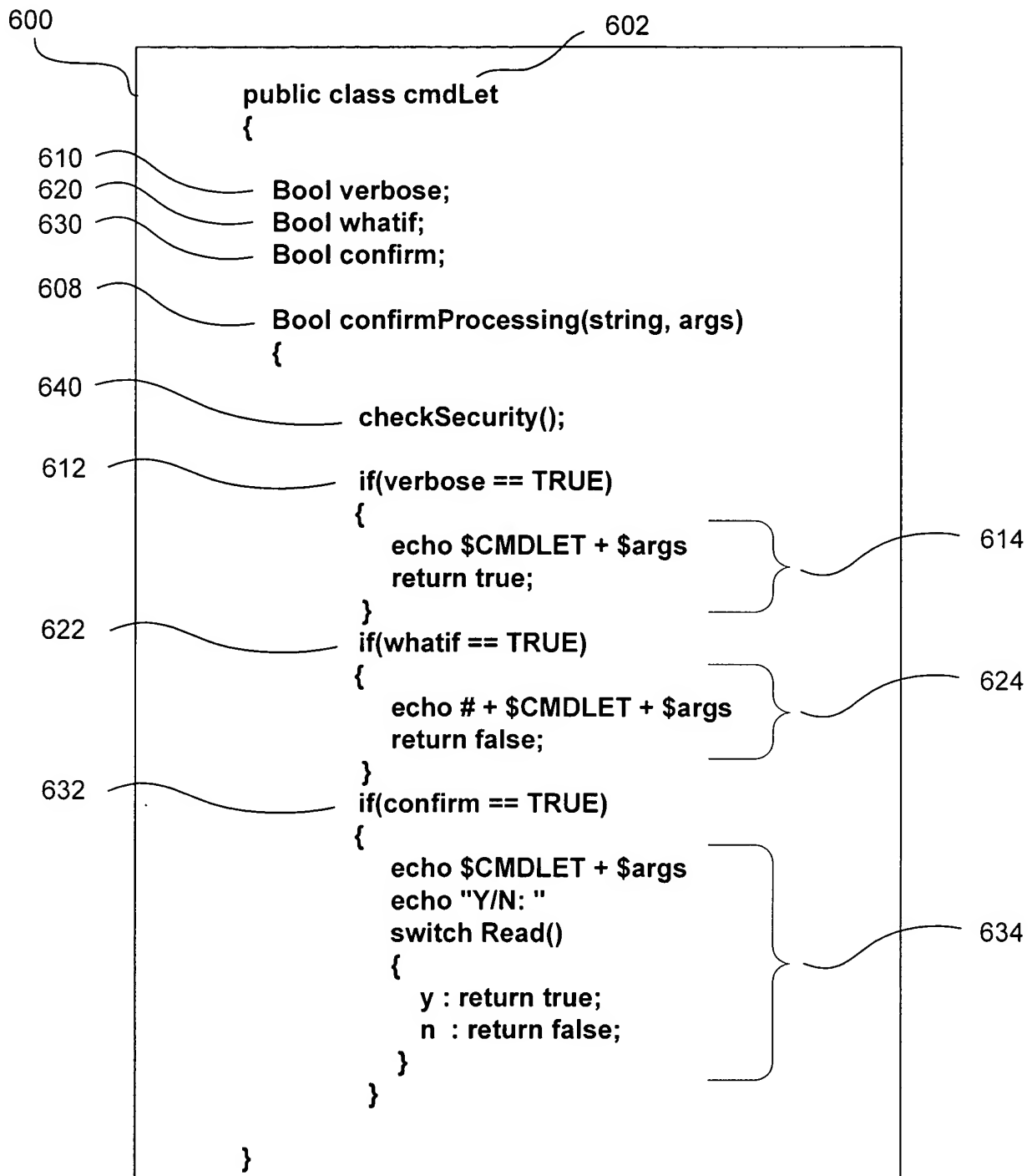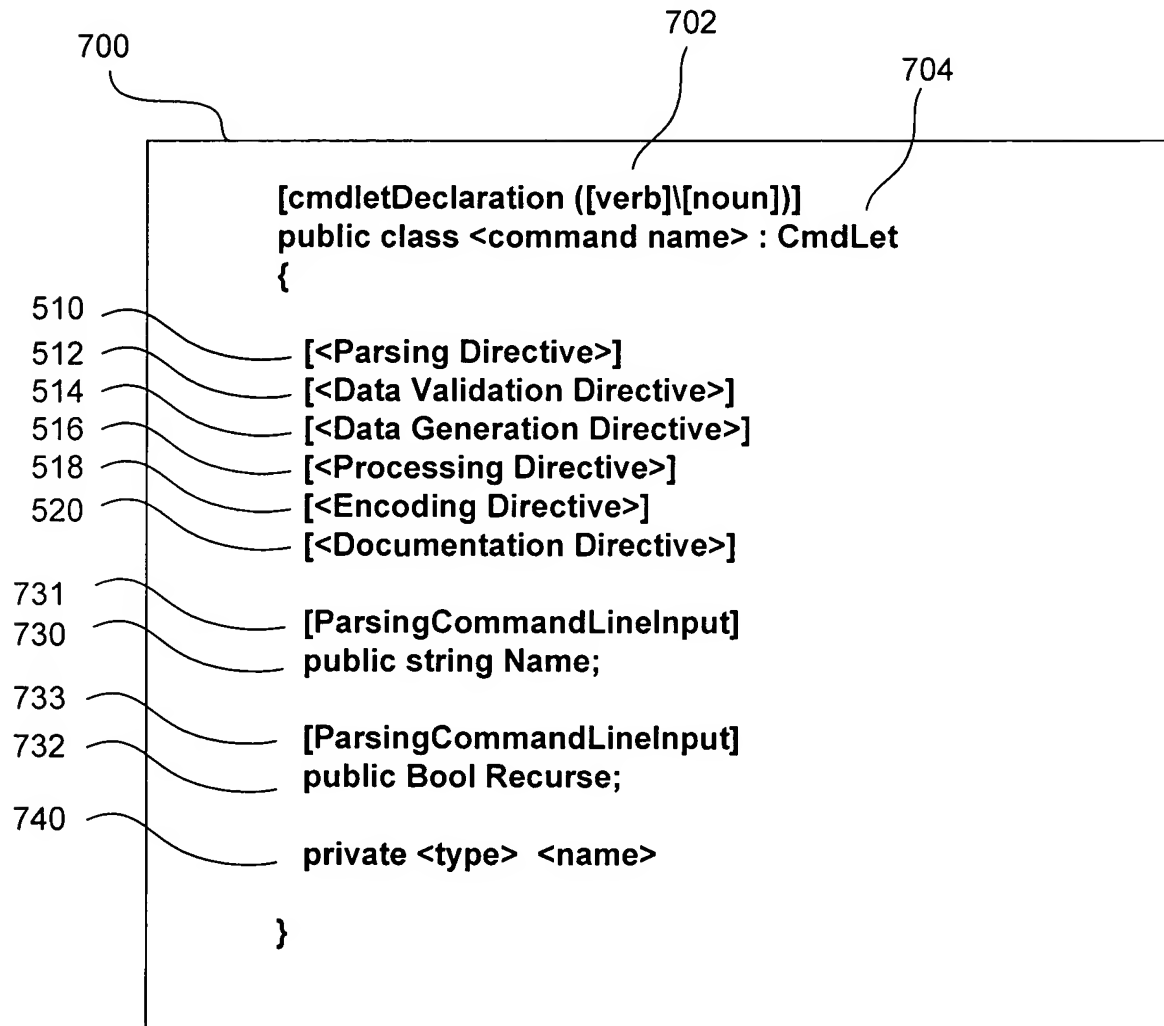Inventor:s: Snover et al.
Docket No: MS1-1740US

600

602

```
public class cmdLet
{
    Bool verbose;
    Bool whatif;
    Bool confirm;

    Bool confirmProcessing(string, args)
    {
        checkSecurity();

        if(verbose == TRUE)
        {
            echo $CMDLET + $args
            return true;
        }
        if(whatif == TRUE)
        {
            echo # + $CMDLET + $args
            return false;
        }
        if(confirm == TRUE)
        {
            echo $CMDLET + $args
            echo "Y/N: "
            switch Read()
            {
                y : return true;
                n  : return false;
            }
        }
    }
}
```

610
620
630

608

640

612

614

622

624

632

634

Fig. 6

Title: Mechanism for Obtaining and Applying Constraints to Constructs
within an Interative Environment
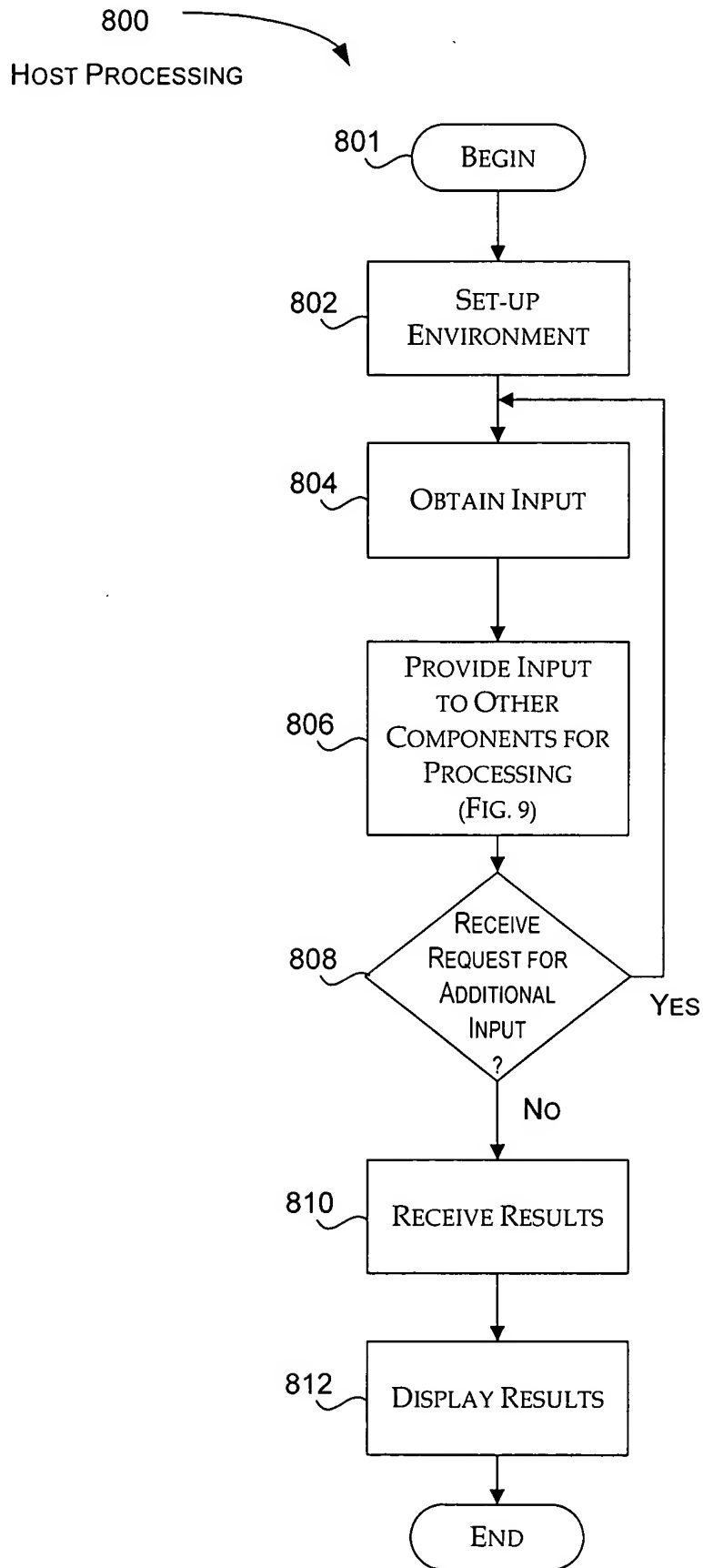Inventor:s: Snover et al.
Docket No: MS1-1740US

700   702   704

```
[cmdletDeclaration ([verb]\[noun])]
public class <command name> : CmdLet
{

510    [<Parsing Directive>]
512    [<Data Validation Directive>]
514    [<Data Generation Directive>]
516    [<Processing Directive>]
518    [<Encoding Directive>]
520    [<Documentation Directive>]

731    [ParsingCommandLineInput]
730    public string Name;

733    [ParsingCommandLineInput]
732    public Bool Recurse;

740    private <type>  <name>


}
```

Fig. 7

Title: Mechanism for Obtaining and Applying Constraints to Constructs
within an Interative Environment
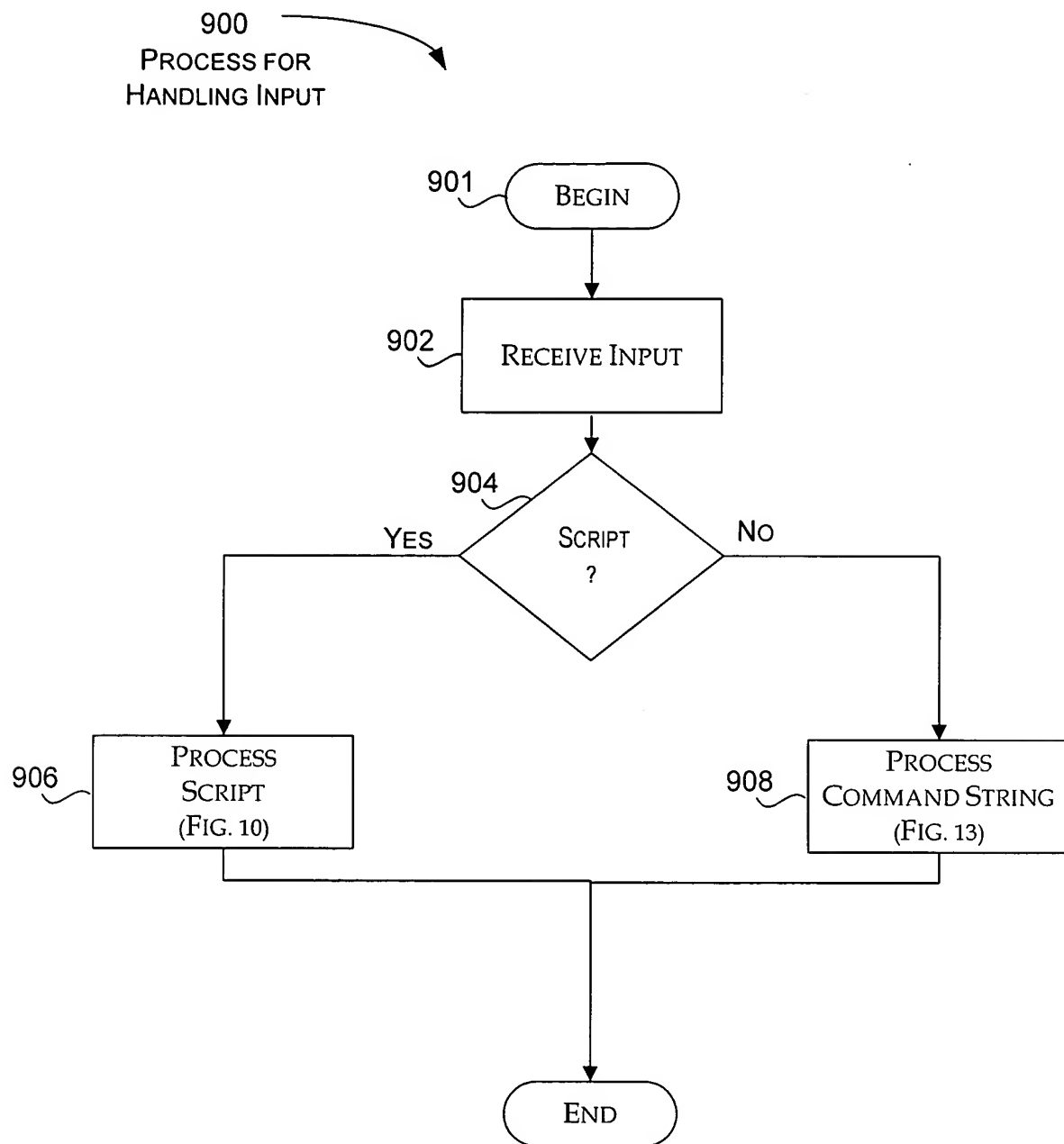Inventor:s: Snover et al.
Docket No: MS1-1740US

800

HOST PROCESSING

801 — BEGIN

802 — SET-UP ENVIRONMENT

804 — OBTAIN INPUT

806 — PROVIDE INPUT TO OTHER COMPONENTS FOR PROCESSING (FIG. 9)

808 — RECEIVE REQUEST FOR ADDITIONAL INPUT ?

YES

No

810 — RECEIVE RESULTS

812 — DISPLAY RESULTS

END

Fig. 8

Title: Mechanism for Obtaining and Applying Constraints to Constructs
within an Interative Environment
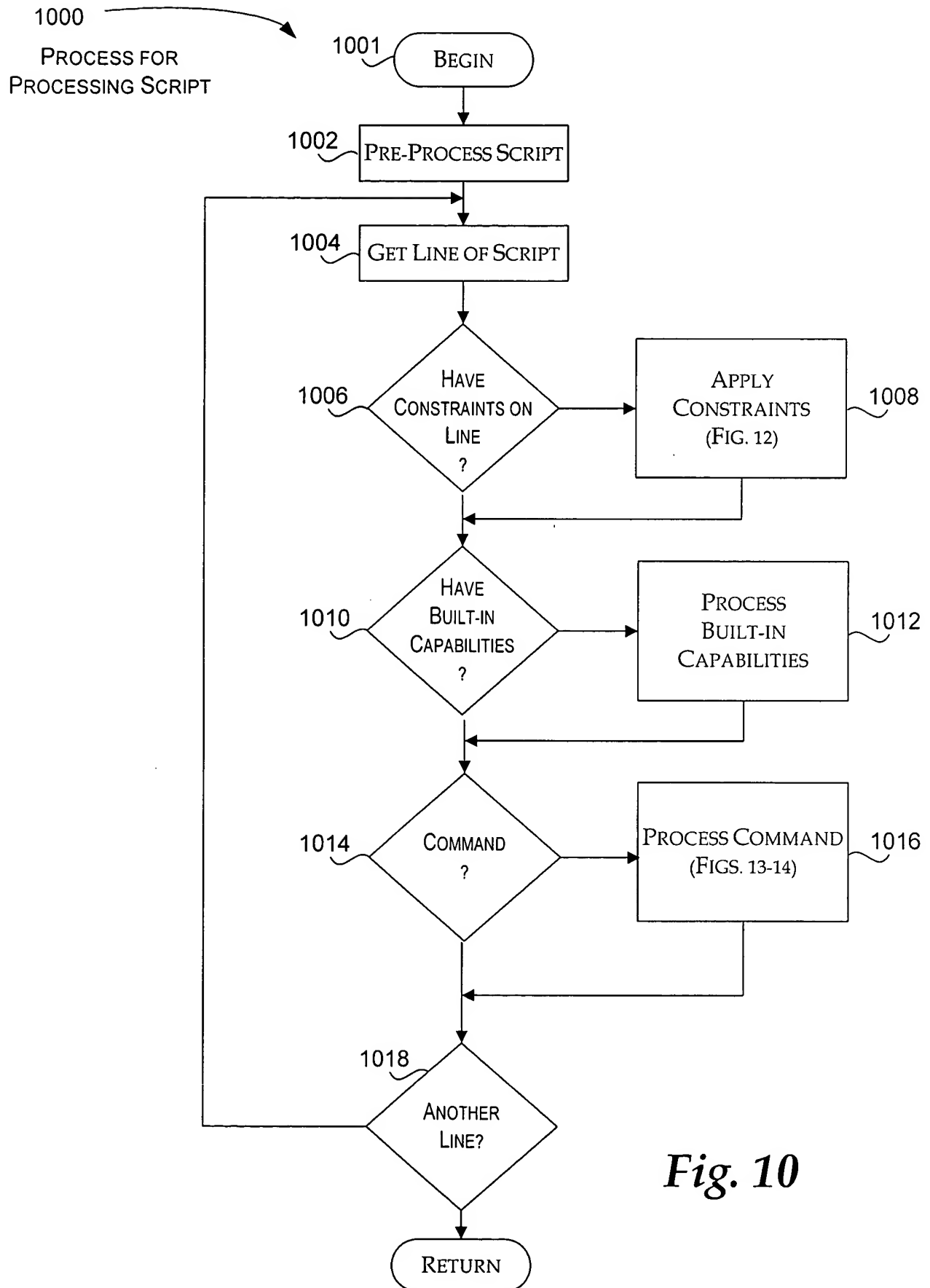Inventor:s: Snover et al.
Docket No: MS1-1740US

900
PROCESS FOR
HANDLING INPUT

901 — BEGIN

902 — RECEIVE INPUT

904 — SCRIPT ?

YES

NO

906 — PROCESS SCRIPT (FIG. 10)

908 — PROCESS COMMAND STRING (FIG. 13)

END

Fig. 9

Title: Mechanism for Obtaining and Applying Constraints to Constructs
within an Interative Environment
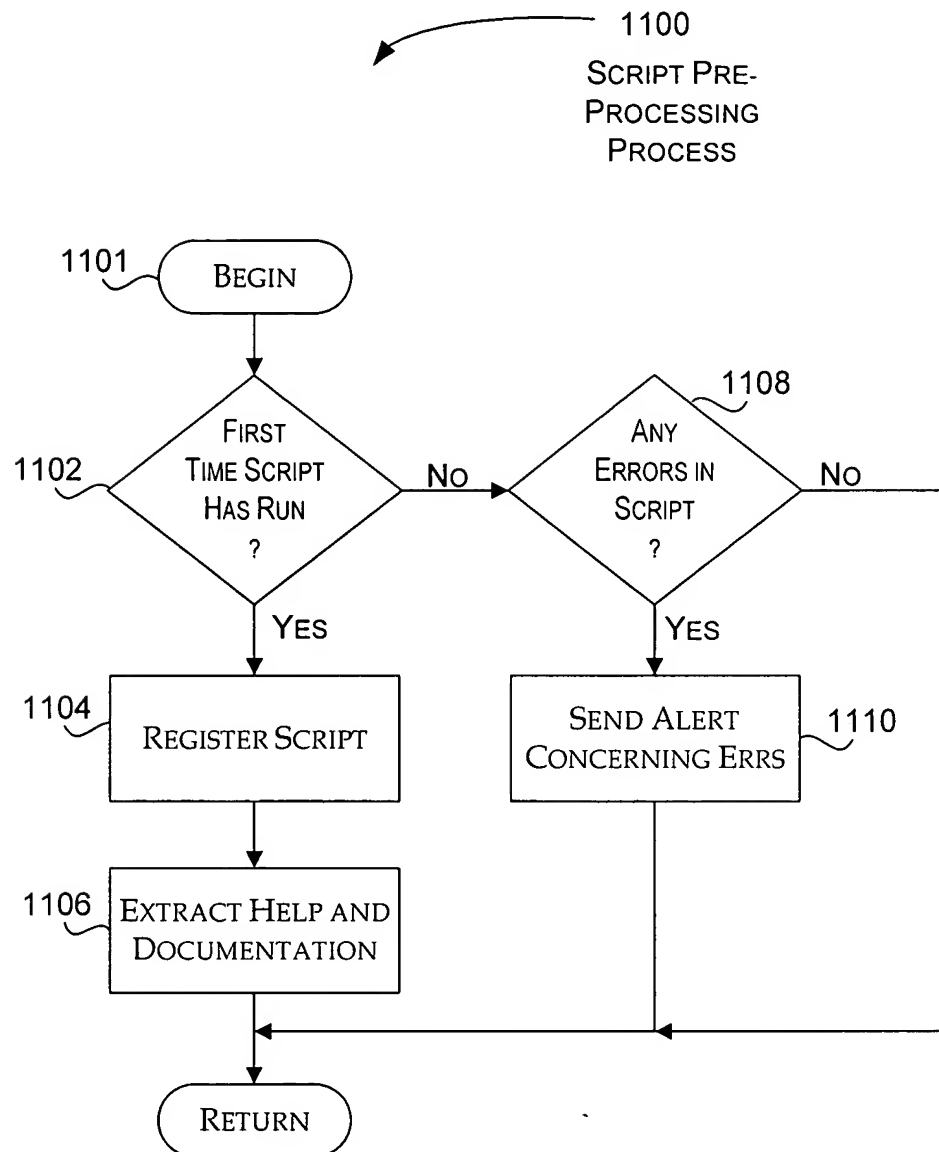Inventor:s: Snover et al.
Docket No: MS1-1740US

1000

PROCESS FOR
PROCESSING SCRIPT

1001 — BEGIN

1002 — PRE-PROCESS SCRIPT

1004 — GET LINE OF SCRIPT

1006 — HAVE CONSTRAINTS ON LINE ? → APPLY CONSTRAINTS (FIG. 12) 1008

1010 — HAVE BUILT-IN CAPABILITIES ? → PROCESS BUILT-IN CAPABILITIES 1012

1014 — COMMAND ? → PROCESS COMMAND (FIGS. 13-14) 1016

1018 — ANOTHER LINE?

RETURN

Fig. 10

Title: Mechanism for Obtaining and Applying Constraints to Constructs
within an Interative Environment
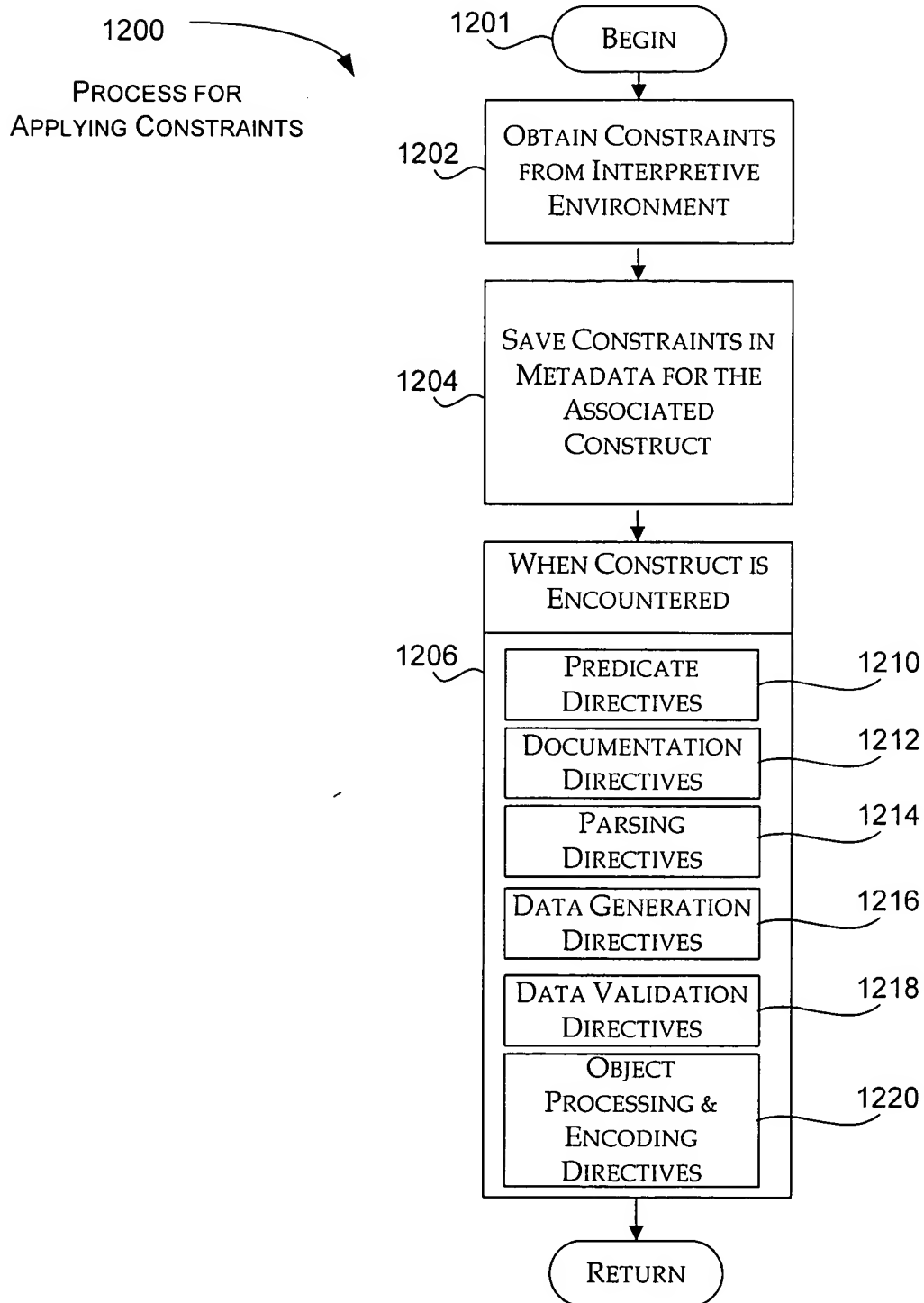Inventor:s: Snover et al.
Docket No: MS1-1740US

1100

SCRIPT PRE-
PROCESSING
PROCESS

1101 — BEGIN

1102 — FIRST
TIME SCRIPT
HAS RUN
?

No

1108 — ANY
ERRORS IN
SCRIPT
?

No

YES

YES

1104 — REGISTER SCRIPT

1110 — SEND ALERT
CONCERNING ERRS

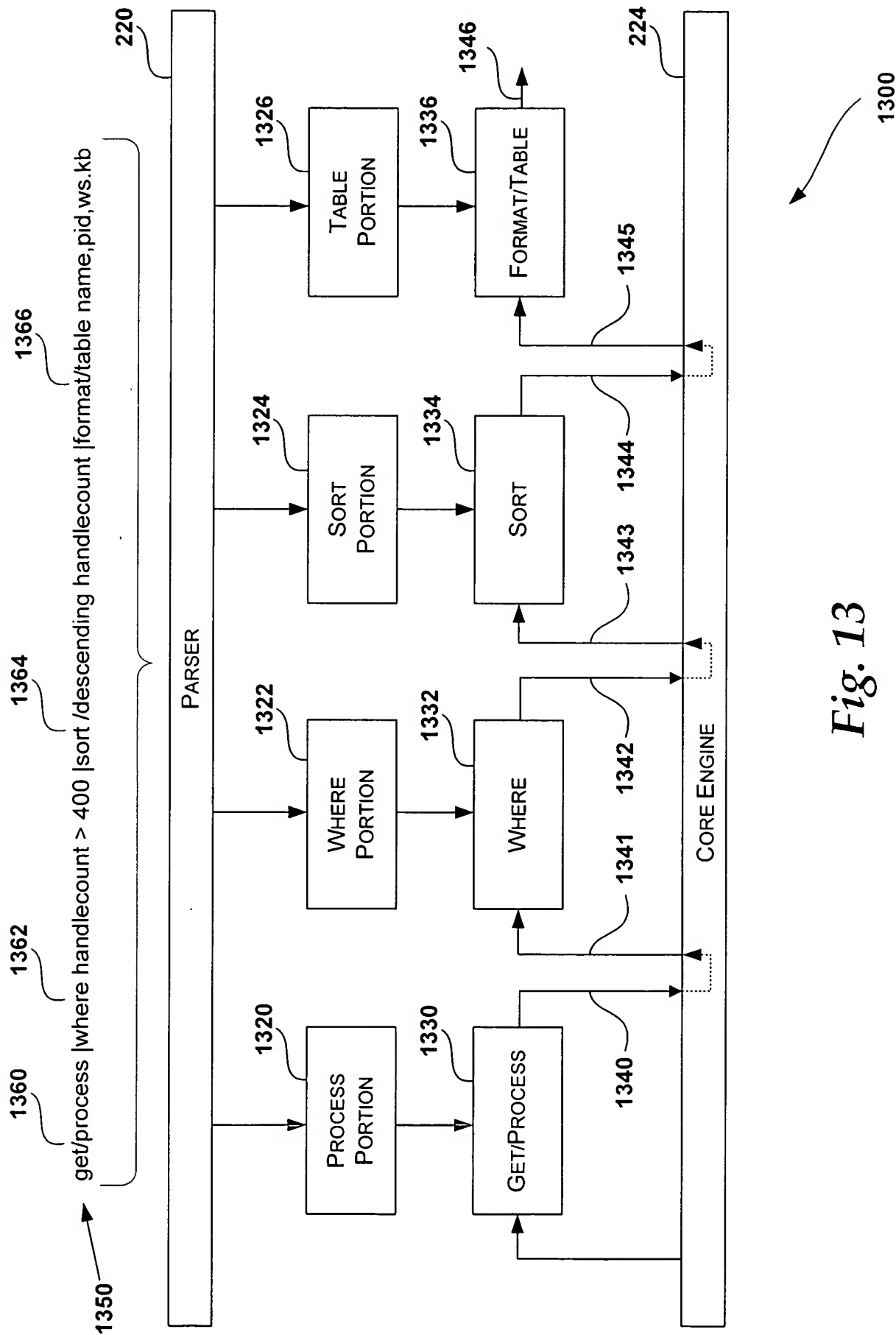1106 — EXTRACT HELP AND
DOCUMENTATION

RETURN

Fig. 11

Title: Mechanism for Obtaining and Applying Constraints to Constructs
within an Interative Environment
Inventor:s: Snover et al.
Docket No: MS1-1740US

1200

PROCESS FOR
APPLYING CONSTRAINTS

1201 — BEGIN

1202 — OBTAIN CONSTRAINTS
FROM INTERPRETIVE
ENVIRONMENT

1204 — SAVE CONSTRAINTS IN
METADATA FOR THE
ASSOCIATED
CONSTRUCT

WHEN CONSTRUCT IS
ENCOUNTERED

1206

PREDICATE
DIRECTIVES — 1210

DOCUMENTATION
DIRECTIVES — 1212

PARSING
DIRECTIVES — 1214

DATA GENERATION
DIRECTIVES — 1216

DATA VALIDATION
DIRECTIVES — 1218

OBJECT
PROCESSING &
ENCODING
DIRECTIVES — 1220

RETURN

Fig. 12

Title: Mechanism for Obtaining and Applying Constraints to Constructs
within an Interative Environment
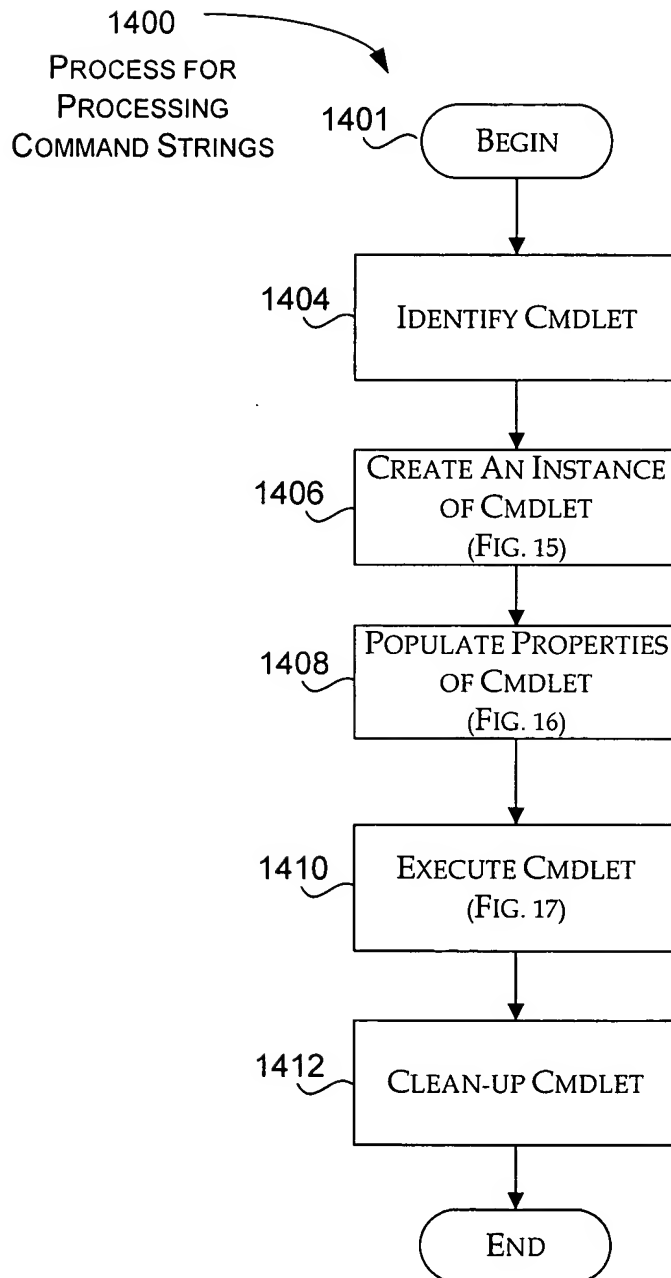Inventor:s: Snover et al.
Docket No: MS1-1740US

Fig. 13

Title: Mechanism for Obtaining and Applying Constraints to Constructs
within an Interative Environment
Inventor:s: Snover et al.
Docket No: MS1-1740US

1400

PROCESS FOR
PROCESSING
COMMAND STRINGS

1401

(BEGIN)

1404 — IDENTIFY CMDLET

1406 — CREATE AN INSTANCE
OF CMDLET
(FIG. 15)

1408 — POPULATE PROPERTIES
OF CMDLET
(FIG. 16)

1410 — EXECUTE CMDLET
(FIG. 17)

1412 — CLEAN-UP CMDLET

(END)

Fig. 14

Title: Mechanism for Obtaining and Applying Constraints to Constructs
within an Interative Environment
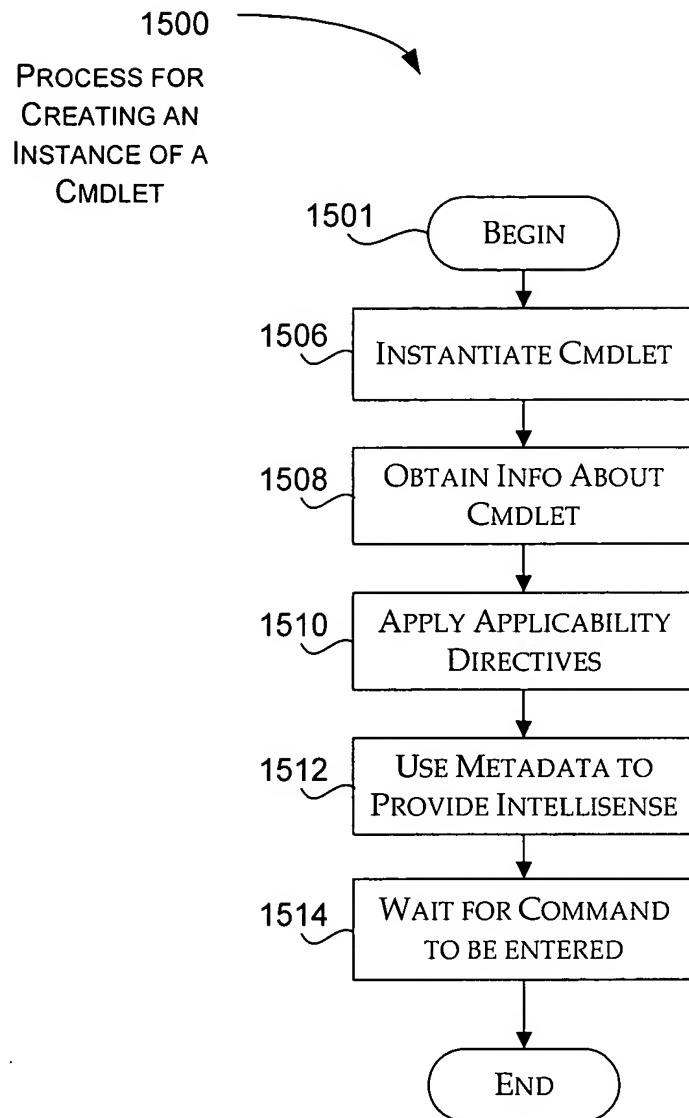Inventor:s: Snover et al.
Docket No: MS1-1740US

1500

PROCESS FOR
CREATING AN
INSTANCE OF A
CMDLET

1501 — BEGIN

1506 — INSTANTIATE CMDLET

1508 — OBTAIN INFO ABOUT
CMDLET

1510 — APPLY APPLICABILITY
DIRECTIVES

1512 — USE METADATA TO
PROVIDE INTELLISENSE

1514 — WAIT FOR COMMAND
TO BE ENTERED

END

Fig. 15

Title: Mechanism for Obtaining and Applying Constraints to Constructs
within an Interative Environment
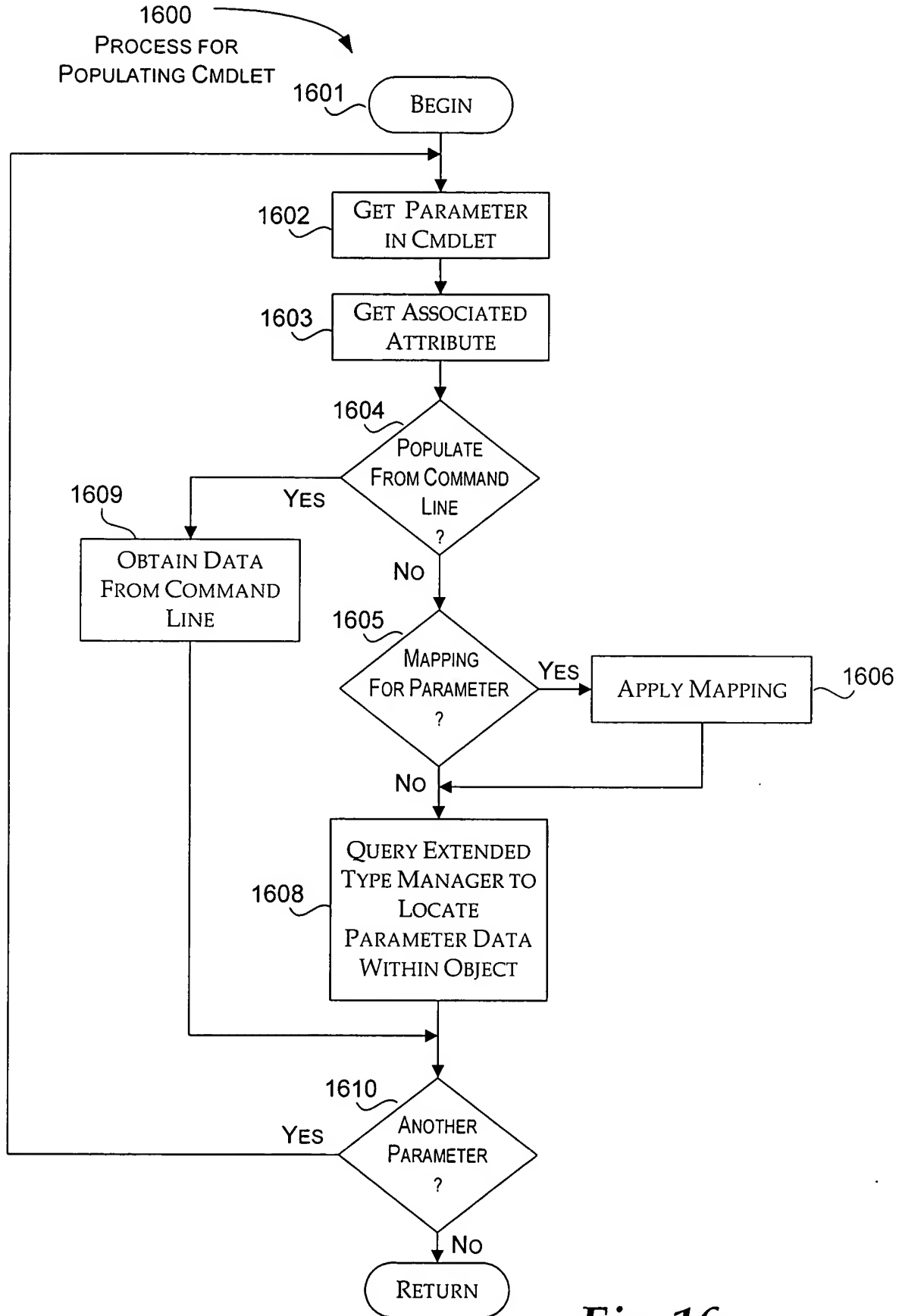Inventor:s: Snover et al.
Docket No: MS1-1740US

1600
PROCESS FOR
POPULATING CMDLET

1601 — (BEGIN)

1602 — GET PARAMETER IN CMDLET

1603 — GET ASSOCIATED ATTRIBUTE

1604 — POPULATE FROM COMMAND LINE ?

YES

1609 — OBTAIN DATA FROM COMMAND LINE

NO

1605 — MAPPING FOR PARAMETER ? — YES — APPLY MAPPING — 1606

NO

1608 — QUERY EXTENDED TYPE MANAGER TO LOCATE PARAMETER DATA WITHIN OBJECT

1610 — ANOTHER PARAMETER ?

YES

NO

(RETURN)

Fig. 16

Title: Mechanism for Obtaining and Applying Constraints to Constructs
within an Interative Environment
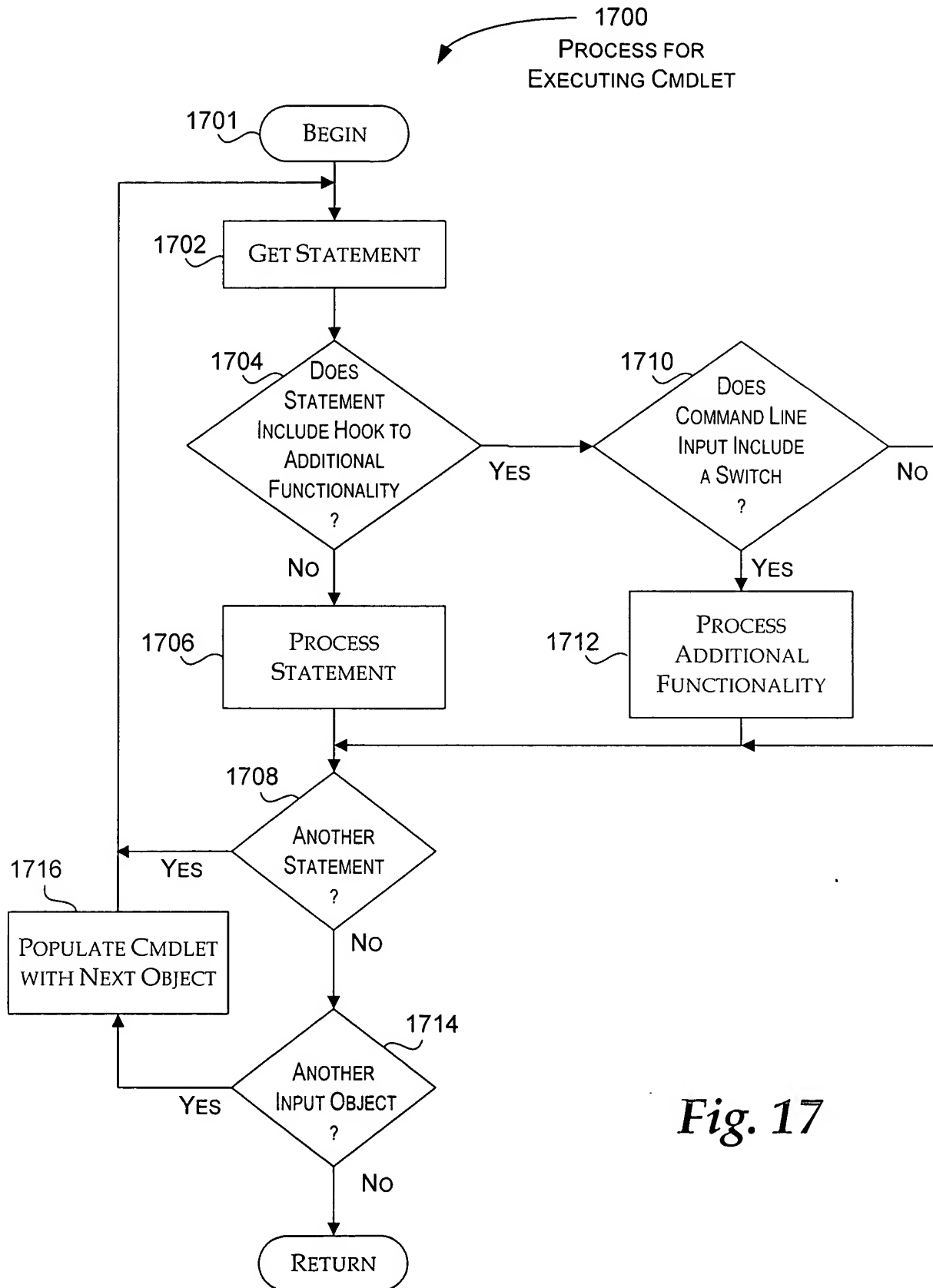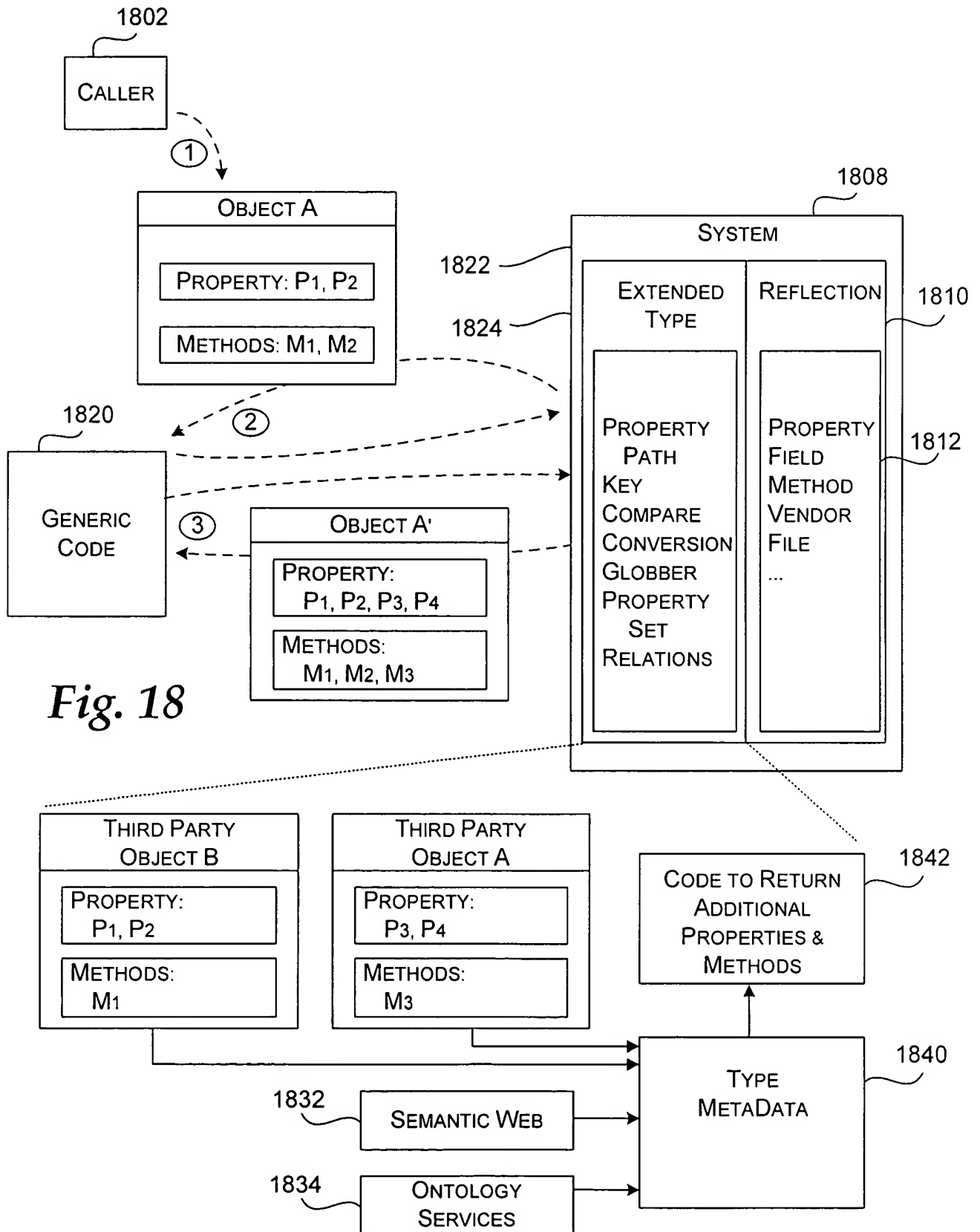Inventor:s: Snover et al.
Docket No: MS1-1740US

1700
PROCESS FOR
EXECUTING CMDLET

1701 — BEGIN

1702 — GET STATEMENT

1704 — DOES STATEMENT INCLUDE HOOK TO ADDITIONAL FUNCTIONALITY ?

YES

1710 — DOES COMMAND LINE INPUT INCLUDE A SWITCH ?

NO

No

1706 — PROCESS STATEMENT

YES

1712 — PROCESS ADDITIONAL FUNCTIONALITY

1708 — ANOTHER STATEMENT ?

YES

No

1716 — POPULATE CMDLET WITH NEXT OBJECT

1714 — ANOTHER INPUT OBJECT ?

YES

No

RETURN

Fig. 17

Title: Mechanism for Obtaining and Applying Constraints to Constructs
within an Interative Environment
Inventor:s: Snover et al.
Docket No: MS1-1740US

1802

CALLER

①

OBJECT A

PROPERTY: P1, P2

METHODS: M1, M2

1820

②

GENERIC
CODE

③

OBJECT A'

PROPERTY:
P1, P2, P3, P4

METHODS:
M1, M2, M3

Fig. 18

1808

SYSTEM

1822

1824

EXTENDED
TYPE

REFLECTION

1810

PROPERTY
PATH
KEY
COMPARE
CONVERSION
GLOBBER
PROPERTY
SET
RELATIONS

PROPERTY
FIELD
METHOD
VENDOR
FILE
...

1812

THIRD PARTY
OBJECT B

PROPERTY:
P1, P2

METHODS:
M1

THIRD PARTY
OBJECT A

PROPERTY:
P3, P4

METHODS:
M3

CODE TO RETURN
ADDITIONAL
PROPERTIES &
METHODS

1842

1832 SEMANTIC WEB

1834 ONTOLOGY
SERVICES

TYPE
METADATA

1840

Title: Mechanism for Obtaining and Applying Constraints to Constructs
within an Interative Environment
Inventor:s: Snover et al.
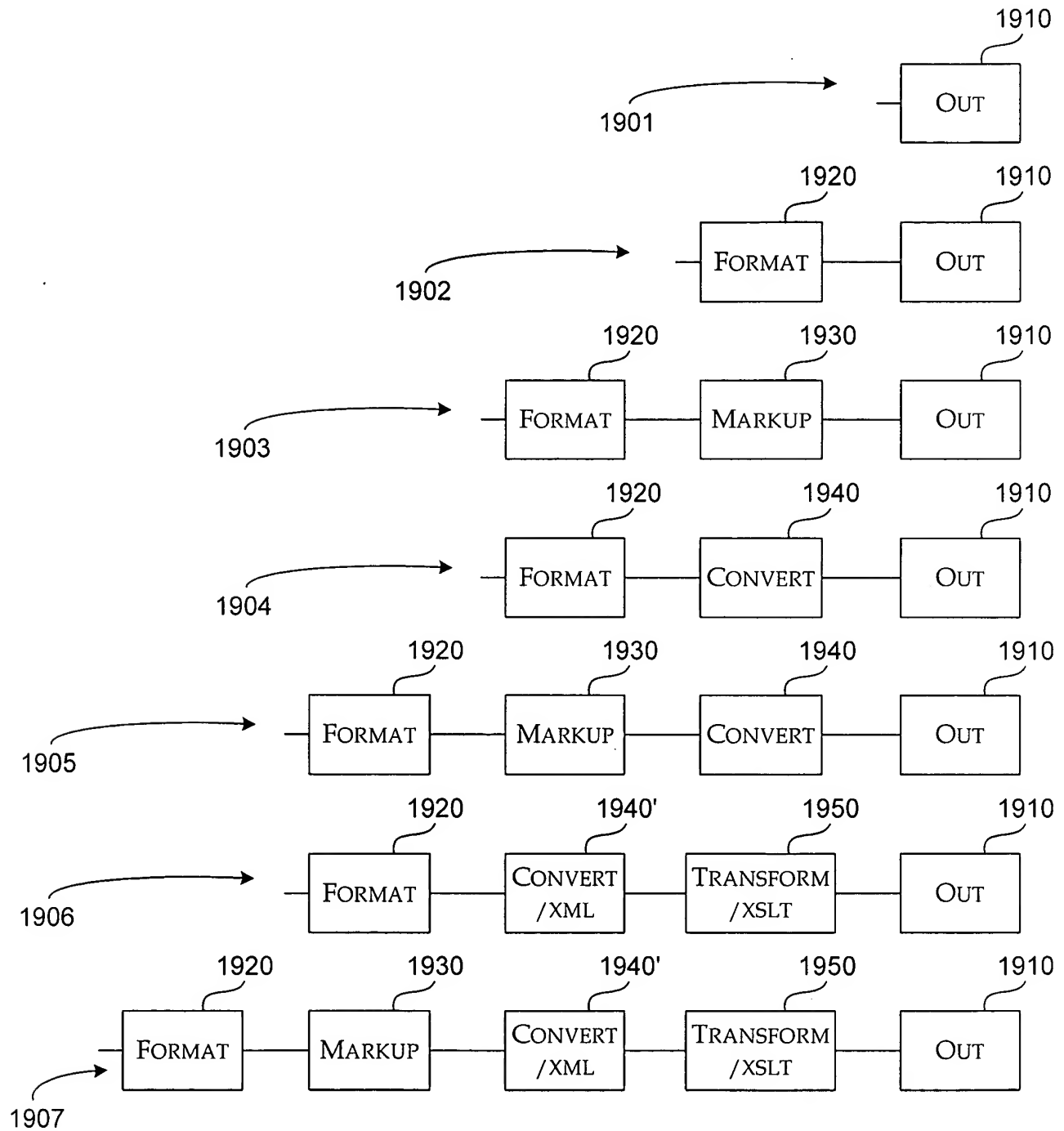Docket No: MS1-1740US

PIPELINING SEQUENCES FOR DATA DRIVEN OUTPUT

Fig. 19

Title: Mechanism for Obtaining and Applying Constraints to Constructs
within an Interative Environment
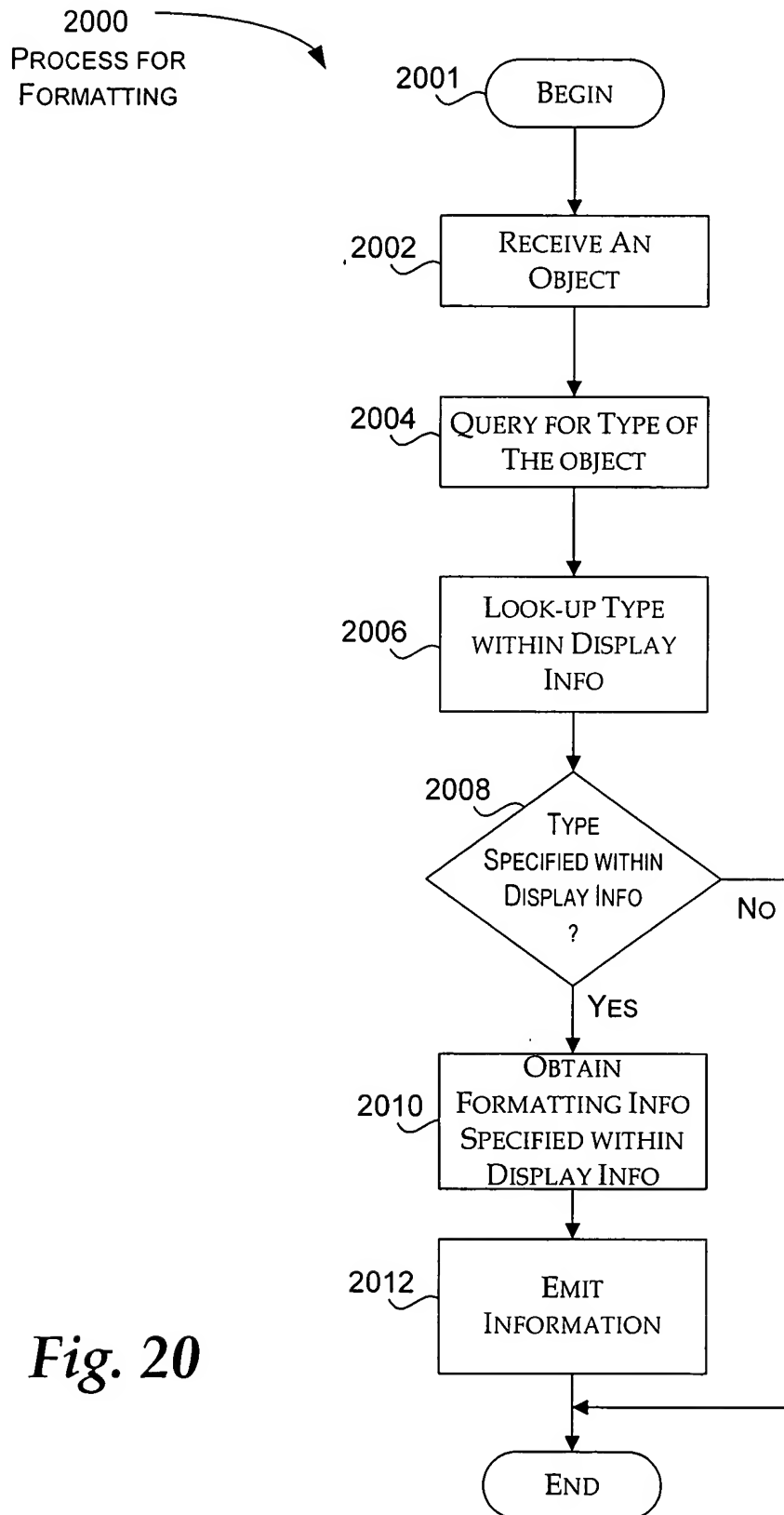Inventor:s: Snover et al.
Docket No: MS1-1740US

2000
PROCESS FOR
FORMATTING

2001 — (BEGIN)

2002 — RECEIVE AN OBJECT

2004 — QUERY FOR TYPE OF THE OBJECT

2006 — LOOK-UP TYPE WITHIN DISPLAY INFO

2008 — TYPE SPECIFIED WITHIN DISPLAY INFO ?

NO

YES

2010 — OBTAIN FORMATTING INFO SPECIFIED WITHIN DISPLAY INFO

2012 — EMIT INFORMATION

(END)

Fig. 20

Title: Mechanism for Obtaining and Applying Constraints to Constructs
within an Interative Environment
Inventor:s: Snover et al.
Docket No: MS1-1740US

2100
EXEMPLARY DISPLAY
INFORMATION

```
<DISPLAYINFO>
 <TYPE> DIRECTORYINFO </TYPE>
 <SHAPE> TABLE </SHAPE>
 <COLUMNS>
  <COLUMN>
   <PROPERTYNAME> LASTWRITETIME </PROPERTYNAME>
  </COLUMN>
  <COLUMN>
   <PROPERTYNAME> SIZE </PROPERTYNAME>
   <ALIGN> LEFT </ALIGN>
   <WIDTH> 10 </WIDTH>
   <FORMATSTRING> D </FORMATSTRING>
   <LABEL> SIZE </LABEL>
  </COLUMN>
 </COLUMNS>
 <HEADER>
  ...
 </HEADER>
 <GROUPBY> PARENTPATH </GROUPBY>
 ...
</DISPLAYINFO>
```

Fig. 21

Title: Mechanism for Obtaining and Applying Constraints to Constructs
within an Interative Environment
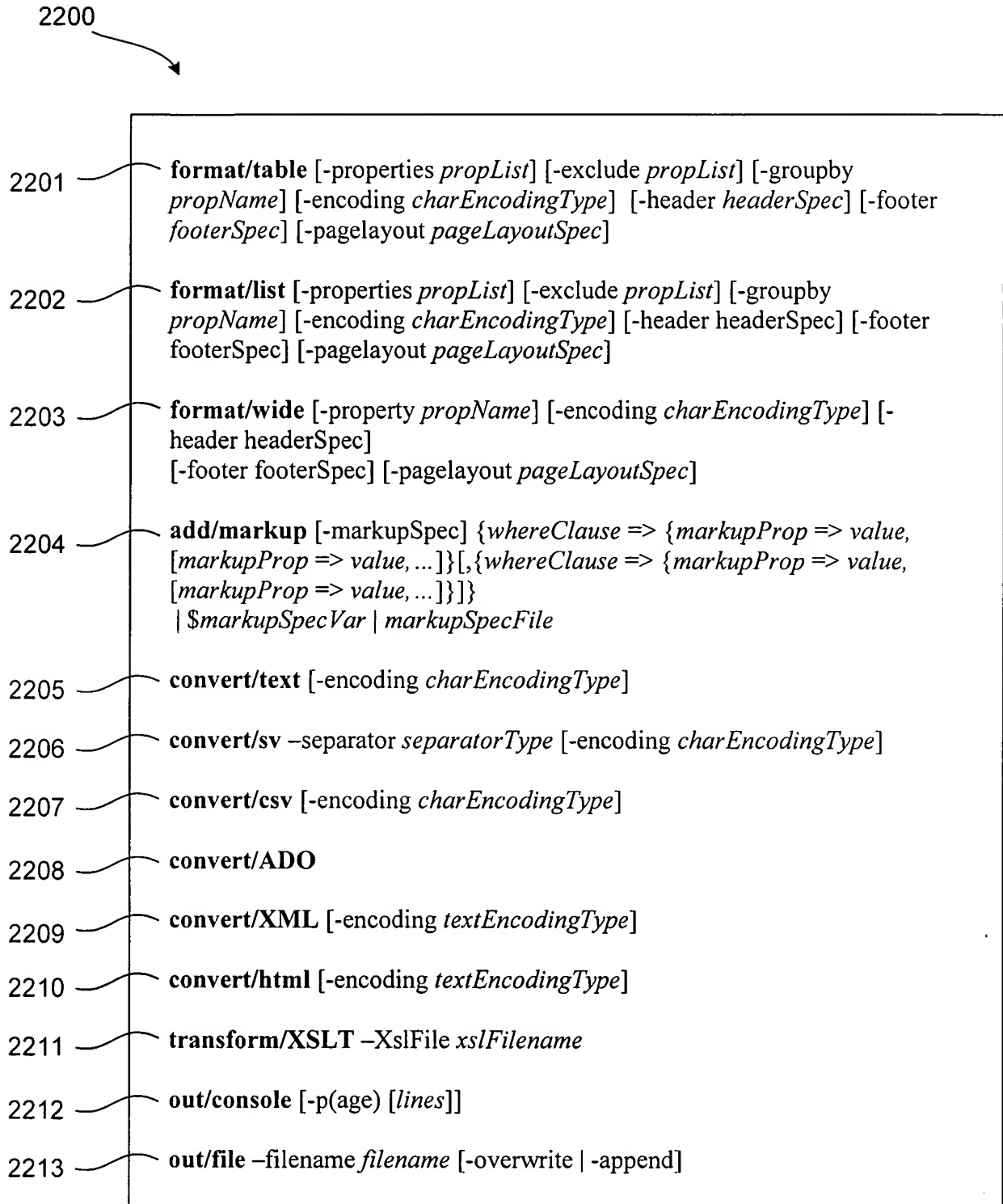Inventor:s: Snover et al.
Docket No: MS1-1740US

2200

format/table [-properties *propList*] [-exclude *propList*] [-groupby
propName] [-encoding *charEncodingType*] [-header *headerSpec*] [-footer
footerSpec] [-pagelayout *pageLayoutSpec*]

— 2201

format/list [-properties *propList*] [-exclude *propList*] [-groupby
propName] [-encoding *charEncodingType*] [-header headerSpec] [-footer
footerSpec] [-pagelayout *pageLayoutSpec*]

— 2202

format/wide [-property *propName*] [-encoding *charEncodingType*] [-
header headerSpec]
[-footer footerSpec] [-pagelayout *pageLayoutSpec*]

— 2203

add/markup [-markupSpec] {*whereClause* => {*markupProp* => value,
[*markupProp* => value, ...*]}[,{whereClause* => {*markupProp* => value,
[*markupProp* => value, ...*]}]*}
 | $*markupSpecVar* | *markupSpecFile*

— 2204

convert/text [-encoding *charEncodingType*]

— 2205

convert/sv –separator *separatorType* [-encoding *charEncodingType*]

— 2206

convert/csv [-encoding *charEncodingType*]

— 2207

convert/ADO

— 2208

convert/XML [-encoding *textEncodingType*]

— 2209

convert/html [-encoding *textEncodingType*]

— 2210

transform/XSLT –XslFile *xslFilename*

— 2211

out/console [-p(age) [*lines*]]

— 2212

out/file –filename *filename* [-overwrite | -append]

— 2213

Fig. 22

Title: Mechanism for Obtaining and Applying Constraints to Constructs
within an Interative Environment
Inventor:s: Snover et al.
Docket No: MS1-1740US

2300

```
[1]$ dir | format/table | out/console

Written               Length.kb Name
6/28/2002 12:52:10 PM    189    sd.exe
11/7/2002 10:59:18 AM     0     sd.ini
6/28/2002 12:52:10 PM   2,633   sd.pdb
6/28/2002 12:52:18 PM    223    sdscc.dll

[2]$ dir | format/list brief.set | convert/text | out/console

Written   : 6/28/2002 12:52:10 PM
Length.kb : 189
Name      : sd.exe

Written   : 11/7/2002 10:59:18 AM
Length.kb : 0
Name      : sd.ini

Written   : 6/28/2002 12:52:10 PM
Length.kb : 2633
Name      : sd.pdb

[27]$ %mymarkupspec = {where length.kb -gt 500 => {applyto => all,
font.name => arial, font.style => bold, font.color => blue}
[28]$ dir i*| format/table | markup %mymarkupspec | out/console

Written                 Length.kb               Name
=================== ============= ==============================
9/11/2002 3:11:10 PM    1,020       Interop.Excel.dll
9/11/2002 3:11:10 PM     192        Interop.Microsoft.Office.Core.dll
9/11/2002 3:11:10 PM     120        Interop.SHDocVw.dll
9/11/2002 3:11:09 PM      12        Interop.TASKSCHEDULERLib.dll
9/11/2002 3:11:10 PM      56        Interop.VBIDE.dll

[1]$ dir | format/table | convert/csv | out/console

"Written","Length.kb","Name"
"6/28/2002 12:52:10 PM","189","sd.exe"
"11/7/2002 10:59:18 AM","0","sd.ini"
"6/28/2002 12:52:10 PM","2633","sd.pdb"
"6/28/2002 12:52:18 PM","223","sdscc.dll"
```

Fig. 23